GUIDE FOR ARCHITECTS-ENGINEERS

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Guide for
Architects - Engineers

General Requirements

Vol 1

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CHAPTER 1

GENERAL INFORMATION

1.1 Purpose of Manual. The purpose of this guide is to inform architect-engineer (A-E) firms or professional service contractors (hereinafter referred to as A-E) of general procedures, standards, policies, and requirements for development and presentation of consulting, planning, and design work for construction projects for Seattle District, Corps of Engineers (hereinafter referred to as District). To efficiently assimilate voluminous material which governs design of projects for the District, the A-E should not only be thoroughly familiar with contents of this guide but should take into account that these procedures may require a more complete and extensive analysis and treatment than is customary in private practice.

1.2 Applicability. The procedures and instructions in this manual shall be used in the planning, design, and preparation of documents the District and will be referenced in the statement of work (SOW) for all A-E contracts where applicable. In the event of conflict between this manual and the contract document, the contract will take precedence. However, the conflict shall be brought to the immediate attention of the contracting officer (CO) and/or contracting officer's representative (COR).

1.3 Coordination With District. The CO may appoint a COR to administer the contract. Each design project in the District is managed by a project manager (PM). The PM may or may not be the COR. Inquiries concerning details of the work may be discussed with the PM or the COR. The PM or COR will assist the A-E in achieving smooth and timely fulfillment of contractual requirements. Any problems relating to design which endanger such fulfillment should be immediately brought to attention of the COR. Oral understandings should be confirmed in writing by either A-E or COR at request of either party. The A-E is cautioned to take instructions from the CO, COR, and/or PM only. Changes in contract scope can only be authorized by the CO. Correspondence by the A-E should be transmitted in triplicate and addressed as follows:

District Engineer
Seattle District, U.S. Army
    Corps of Engineers
Post Office Box C-3755
Seattle, Washington 98124-2255
ATTN: CENPS-E (Name of COR)

1.4 A-E Services. The specific contract requirements for a project will be in appendix A, "Statement of Work," to the A-E contract. A-E contracts normally provide for one or more of the following: Preparation and submission of (1) project planning reports for budgetary and authorization purposes and to establish basis of design, (2) preliminary plans, (3) contract plans, and (4) environmental impact statements. A-E contracts may also include inspection during construction (Title II services), checking shop drawings, and preparing as-built drawings.

1.5 Conduct of Work. In the performance of contracts with the District, the A-E shall:

1.5.1 Execute the work (see typical design submittal requirements) per contract schedule. Immediately advise the COR/PM of any delays.

1.5.2 Furnish (within 5 days) to the COR/PM copies of all written, verbal, and telephone communications pertaining to the work under this contract received from other Government agencies, except where it is clearly indicated that a copy of the communications has been furnished to the COR/PM by the originator.

1.5.3 Acquire, obtain clarification, and incorporate all design criteria and other information required by the contract.

1.6 Contract Modifications. During progress of design, minor changes in basic criteria within general scope of work should be expected, and the A-E should make necessary adjustments in work accordingly. However, in the event of scope changes that the A-E considers to be outside the scope of work, appropriate contract modifications will be negotiated with A-E. Negotiation procedures for a change order follows closely that of a basic contract.

1.7 Contract Payments. The A-E shall submit monthly estimates of value of services rendered on ENG Form 93 (furnished by the District) which will be checked against progress made and certified for payment. Blocks 13, 14, and 15 of Form 93 will be completed by the Government. A "release of claims" must accompany the final payment Form 93.

1.8 Review Comments. Data prepared by the A-E will be reviewed by the District, users, and/or other Government representatives for conformance with the contract requirements. The method of processing review comments at the various review phases as illustrated on the NPD Form 32 (figure l). The A-E shall respond to the review comments by compliance or provide an acceptable explanation for noncompliance. The A-E should indicate the nature and location of his correction in the "Design Office" column of the form. The design office description should be detailed enough for the reviewer to verify compliance without extensive search. All notes, descriptions, etc. should be made on the original. Comment sheets and the originals shall then be returned to the PM for backcheck. In addition copies of previous review comments (with design office column completed) shall be included in the design analysis of the next submittal.

1.9 Checking and Coordinating. The responsibility of the A-E for checking and coordination of all drawings and specifications cannot be overemphasized. A-E is responsible for producing complete, competent, properly coordinated, and thoroughly checked design documents within agreed schedules. A final, independent, thorough check by the A-E shall be accomplished of all plans and specifications and other required data prior to any scheduled review. This check and coordinating review shall be for the purpose of eliminating errors, interferences, inconsistencies between all design disciplines of the work, inconsistencies between drawings and specifications, and for the incorporation of criteria, review comments, guide specifications, and information included in this manual. The A-E shall submit a fully coordinated check print set and quality control checklist (see addendum) showing comprehensive review effort. Designs containing numerous drafting, typing, and referencing errors will be returned to the A-E for checking and resubmittal.

1.10 Trade Names and Proprietary Items. The use of trade names, proprietary items, and the drafting of a specification by adopting a manufacturer's description of a particular commercial article shall be avoided. The item shall be specified by giving its physical characteristics, chemical composition, laboratory test results, and performance in actual

use in such a manner as to insure full and free competition among suppliers. Full justification and Government approval is required prior to specifying any unique or "single manufacturer" items for specific Government projects. Such items shall be submitted with justification for their use at the concept submittal stage.

1.11 Guide Specifications. In order to promote uniformity of construction throughout the Corps, guide specifications will be given to the A-E's on all projects. The guide specifications are complete specifications which must be edited by the designer to remove inapplicable items and occasionally to add some information. Each guide specification has a number of "notes to the designer" in the rear which are important since they contain criteria. The technical manuals also contain information on preparation of technical sections of the specifications and should be fully utilized. The guide specifications also indicate items to be shown on the drawings and in this regard can act as a checklist for the designer. The designer shall edit each guide specification by marking it up with a black pencil and sending a copy of the "marked-up guides," along with the typed specifications, with the final submittal. For areas where guide specifications do not exist, the A-E shall prepare the complete specification. Detailed instructions for preparation of specifications are covered in this A-E Guide, Volume 3.

1.12 Construction Cost Estimate. The estimate of cost submitted with the concept or early preliminary submittals shall be as accurate as possible based on the design accomplished at that time. These estimates will be used for programming and budgeting purposes and will be a major factor in determining if the project is to proceed through the final design and construction phases. The A-E shall design the project within the programmed funds. If, at any time, it becomes apparent that the project cost will exceed the programmed amount, the A-E shall notify the COR/PM immediately. The A-E shall suggest cost savings measures. These cost saving measures are basic design and not considered value engineering (VE) studies listed below. The estimate shall be supported by a complete written takeoff which is organized and correlated with the design documents. Price quotes shall also be documented with names, telephone numbers, and product cuts. Detailed instructions for preparation of cost estimates are covered in this A-E Guide, Volume 2.

1.13 Value Engineering. The District reserves the right to perform VE studies on projects either during or after completion of design. The VE studies may be performed by the District or other A-E forces designated by the District. The District, at its discretion, may modify A-E contracts to implement any or all design changes resulting from the VE studies or the engineering evaluations after completion of design. The A-E, during the course of his design, shall be alert for and shall identify those high cost, low value items or areas which he considers may be accomplished in different ways and possibly at less cost. For projects with an estimated construction cost over $500,000, the A-E shall review project for value engineering potential and submit with the 35 percent documents a list of approximately 10 (or more) project features offering best potential value engineering savings. These features may include layout, principle features of construction, criteria, scope, or any item having "high cost low value" where value improvements can be accomplished. The A-E shall include a brief statement of the rationale for proposing each feature listed. This list shall be accomplished through brainstorming techniques by A-E's multidiscipline staff and be certified by a senior designer that it represents the best efforts of the firm.

1.14 Site Visits. The A-E shall make adequate visits to the project site to become familiar with local conditions. In some cases, as-built surveys, geotechnical

investigations, and survey services may be required. The A-E shall contact the COR/PM for coordination of all site visits.

1.15 Safety. All work shall include the necessary features required to produce a facility in which safety has been incorporated so as to conform to the established safety codes and regulations. Particular attention shall be given to such safety features as snow guards, windscreens, mechanical equipment guards, stairway head clearances, handrails, access hatches, ladder cages, fixed ladders, and nonslip treds. All projects shall meet the requirements of the Corps of Engineers Safety Manual EM 385-1-1, OSHA Standards, and other applicable user/agency safety standards.

1.16 Use of Automatic Data Processing Systems (ADPS). The District encourages use of ADPS whenever this will result in cost reductions and/or improved design.

1.16.1 The A-E shall furnish writeups or identification of programs to be used on major features of the work as part of the concept (early preliminary) submittal. The writeup shall contain sufficient detail so that the general method of solution and problem limitations may be identified and test problem data may be assembled for trial runs by the District if desired. When programs not otherwise identified are implemented while the work is in progress, output listings shall include enough input data and intermediate results to afford manual checks on the final results.

1.16.2 When designs are accomplished by ADPS, the design analysis will include description of design methods, including assumptions, theories, and technical formulas, employed. Copies of ADPS input data and output listings shall be presented, annotated in language understandable by personnel not familiar with ADPS, and accompanied by diagrams and notations of sufficient detail to facilitate manual checks of final results. Computer programs employed shall be described so that the general methods of solution and program limitation are identified. ENG Form 2883, Electronic Computer Program Abstract, may be used for this purpose. Location of ADPS cards, tapes, or other pertinent medium utilized in the design analysis shall be indicated.

1.16.3 Unless otherwise specified, data card decks, discs, or tapes used for final computations shall be retained by the A-E for the life of the construction contract and shall be available to the District without additional cost.

1.16.4 When earthwork designs are processed by computer, plotted cross sections shall not be furnished except to clarify the structural or geometric arrangement of the proposed installation. When plotted cross sections are not used to prepare quantity estimates, the A-E shall note in the outline and final specifications that plotted cross sections are not available for the bidder's inspection.

1.16.5 The District's approval of any computer program or acceptance of computed results shall not relieve an A-E of any responsibility for accuracy of data or technical validity of assumptions and formulas used. All input data shall be double checked for accuracy.

1.17 Austerity in Design. All design and construction shall be performed consistent with the principals of maximum economy. Materials and finishes shall result in minimum maintenance and first cost. Efforts shall be made to produce esthetically pleasing structures, especially for buildings housing functions pertaining to administration,

housing, community, or morale. This embraces use of suitable facing materials to provide a more pleasing appearance, use of picture windows, overhangs, architectural treatment of main entrances, and other measures. The basic concept is to achieve pleasing appearance with due consideration of economy of design and without resort to purely decorative features. This improved appearance concept does not apply to industrial type buildings located in industrial areas of the complex. Energy conservation and VE are also important design considerations.

1.18 Federal. State. and Local Pollution Abatement Criteria and Environmental Permits. To avoid wasted effort, the A-E shall contact permitting agencies early in the design process. The A-E shall insure that the project is in full compliance with the requirements of all Federal, state, and local clean air, clean water, water rights, resource recovery, and solid waste disposal standards and the Federal Endangered Species Act. All applicable standards and criteria shall be obtained and reviewed by the A-E.

1.18.1 The A-E shall identify, in the design analysis, the following:

1.18.1.1 The permitting authority(ies).

1.18.1.2 Construction/operating permits required.

1.18.1.3 Time required by the permitting agency(ies) to process the application(s).

1.18.1.4 Fee schedule, including filing/application fees, emissions fees, certification testing, etc.

1.18.1.5 Monitoring and/or compliance testing requirements.

1.18.1.6 Actual agency regulations governing applications, exemptions, variances, etc.

1.18.2 Should permits be required, the A-E shall obtain all required application forms, complete all technical sections, and provide the partially completed forms to the Seattle District. The A-E shall prepare all supporting material required for the applications, including emission surveys, diagrams, pollutant load calculations, etc.

1.18.3 The A-E shall notify the District of any major discrepancies existing between the A-E design criteria provided and the pollution abatement criteria.

1.18.4 Copies of all correspondence from permitting agencies which either detail permit requirements or indicate that no permits are necessary shall be furnished to the District by the A-E.

1.19 Standard Drawings. Standard plans and/or fully developed project plans and design analysis, prepared by others, furnished for a site adaptation to another site, shall be carefully reviewed for technical adequacy and for conformance to criteria furnished, which may in some instances supersede data on the standard plans, and shall be corrected as required. When errors or deficiencies are found in the definitive or standard plans, complete details with recommendation of corrective action necessary shall be reported by letter. Complete adaptation to the site and for connection to utilities at that site will

be required. Standard plans and/or site adaptation plans will be furnished by the District. In the event that readable prints cannot be obtained, the A-E shall prepare a new drawing of the quality required by the drafting standards.

1.20 Extra Services. A-E's are not to perform services requested which are considered to be a change in his contract until a proposal covering such extra services, has been made, a mutually satisfactory fee has been negotiated, and a written notice to proceed has been received.

1.21 Responsibility After Design Completion. The A-E will be required to support the District after completion of his contract should errors or omissions in the documents prepared by the A-E create problems in bidding or administering the contract for construction. The support provided by the A-E shall take whatever form is necessary to correct the errors or omissions in the original documents. Such required corrections shall be done at no additional cost to the Government. Action shall be prompt in order to minimize impact costs to the Government/A-E.

CHAPTER 2

A-E CONTRACT PROCEDURES AND REQUIREMENTS

2.1 Synopsis of A-E Actions Before Contract Award.

2.1.1 Predesign Conference. Upon approval of selection, the A-E will be notified in writing. This notification will contain a brief description of the nature and scope of the project. The A-E will be requested to visit the District and/or project site to participate in predesign/prenegotiation conferences prior to preparation of a proposal and actual negotiations. There may be a separate predesign and a separate prenegotiation conference or they may be combined into one meeting. During the predesign conference, the PM will discuss the technical requirements and the general approach with the A-E's designers. The users of the facility may also attend this conference. The A-E will be furnished with a draft SOW, PB's, DD Form 1391, this guide, design criteria, and such other data that defines the extent of the work to be done. At this time the A-E may propose design changes he feels would be in the best interests of the project. The scope of Army projects are rigidly set by the DD 1391 and little change is allowed at the predesign conference. The Air Force uses the predesign conference as a primary design tool and the minutes of the conference become the major design scoping document.

2.1.2 Prenegotiation Conference. During the prenegotiation conference, the required effort which will affect the A-E's fee are discussed to enable the A-E to make a reasonable proposal. The District negotiator is the A-E's point of contact for matters relating to the fee proposal. Questions pertaining to technical matters will be addressed to the negotiator and questions pertaining to nontechnical contractual related matters will be directed to the procurement representative. The proposal and the design quality assurance (DQA) plan (see 2.1.4) shall be required to be submitted on a specific date established by mutual agreement during the prenegotiation conference. The supporting data required by the District negotiator will also be specified at this time.

2.1.3 Fee Proposals. The A-E's proposal shall be prepared by a detailed analysis method based on man-hour requirements and skills involved, which establishes values of A-E services. The proposal will be broken down to extent necessary to permit negotiation of a fair and reasonable price and will include an attached estimated schedule of drawings and/or outlines or report as well as a listing of major activities involved in completing the A-E contract.

2.1.4 Design Quality Assurance Plan. The A-E will submit concurrently with the fee proposal, but under a separate cover a logical plan to follow to accomplish the required design services. This plan, to be reviewed by the District, is considered to be merely a formalized version of the plan that an A-E uses on all his projects for private industry. The A-E will be expected to closely follow the DOA plan throughout the course of the project to assure a quality end product. Should future events dictate revisions to the approved DQA plan, the A-E is required to notify the COR/PM in writing and submit the revised plan for approval. The following elements are to be included in the DQA plan:

2.1.4.1 Management Approach. Define the specific management methodology to be followed during the course of the contract, including such aspects as design coordination procedures, quality control, communications, and managerial continuity and flexibility. Names of all associates and consultants who will perform services on the project shall be identified.

2.1.4.2 Management Structure. Delineate the organizational composition of the firm to clarify the interrelationship of the management design team components, including all consultants. Include an organization chart to identify the key design and review team members showing their specific organizational responsibilities.

2.1.4.3 Quality Control. The A-E shall have a logical and functional quality control program to minimize errors or deficiencies. The A-E shall perform independent technical reviews and correct all errors and deficiencies in the design documents prior to submitting them to the Government for review. This review shall be accomplished by persons not directly involved in design but with expertise in the design. The final check prints of the drawing shall reflect a complete review by yellowing out correct items and making corrections in red. This set of check prints shall be provided with each submittal for review by the District.

> CAUTION: The A-E is cautioned to place special emphasis on this aspect of the DQA plan. The contractual obligation of the A-E to provide complete, well coordinated, and error free documents has far reaching consequences. In the event possible subsequent damage to the Government results from negligent performance of any of the services to be furnished under this contract, the A-E will be held liable for such damages. The Government’s reviews in no way relieve the A-E of these contractual responsibilities. For this reason, an effective quality control plan is very important.

2.1.4.4 Planning and Scheduling. A time-scaled bar chart or CPM design schedule showing the sequence of events involved in carrying out the project task within the specified period of service shall be provided. This shall be at a detailed level of scheduling with planning efforts focused on identifying major items that most often control the flow of work. Indicate the A-E review and correction period prior to submittal. It should be a forward planning as well as project monitoring tool.

2.1.5 Negotiation. Negotiations will normally be held in the District office. The objective is to assure a mutual understanding of the SOW and to reach an agreement on a fair and reasonable fee. During negotiations, the SOW will be thoroughly reviewed and the A-E's proposal will be examined and discussed in detail. Major changes in the SOW are discouraged at this time unless the A-E has previously notified the negotiator that certain scope changes are necessary. If agreement is reached, the contract will be forwarded to the A-E for signature within approximately 15 days after completion of negotiation. The approval and subsequent award of the contract will constitute the A-E's notice to proceed with the work. If an agreement cannot be reached, a new firm will be selected and procedure repeated.

2.2 Design Phases. Military projects evolve from the major scoping documents of the predesign conference (reference paragraph 2.1.1) and progress through final design to construction contract award. The drawings, design analysis, specifications, and estimate for each phase shall be prepared in accordance with instructions contained within the of this guide and the A-E contract. These requirements may be modified by negotiation for projects of unusual nature or scope if the PM determines the usual format is not appropriate.

2.2.1 Preconcept Design Study Phase (Army Projects). Normally this phase is not part of the A-E contract. This phase represents approximately a 10 percent design effort. If the A-E contract requires this phase, the A-E shall prepare a project development brochure, a project site plan, a building outline plan, and a control estimate.

2.2.2 Concept Design Phase (Air Force Projects). The concept design phase is normally 20 percent of the total design effort and is intended to establish the basic direction of the design effort. This phase will provide a basis for design, schematic drawings, and a gross cost estimate. This phase shall establish a fixed design direction for the project by demonstrating the appropriateness of one design solution over other possible alternatives.

2.2.3 Concept Design Phase (Army Projects). The concept design phase is normally limited to not more than 35 percent of the total design and is based on data furnished for a particular project. Concept design shall include the design requirements in each technical section, drawings, outline specifications, data, and documentation so the using agency can determine if the design is responsive to their design criteria memorandum and provide a firm basis to allow a dependable cost estimate to be prepared and on which the final design can be initiated. Concept design calculations shall be carried to the same percentage of completion as the items they support and shall be included with the concept documents.

2.2.4 Early Preliminary Design Phase (Air Force Projects). Early preliminary design (EPD) represents 35 percent of the total design effort and is intended to fix and illustrate size and character of the entire project as to plan and vertical relationships, functional layout based on work flow, kinds of materials and finishes, structural scheme, and type of mechanical and electrical systems. If a 20 percent concept design phase is submitted, the 35 percent EPD is usually not a required submittal.

2.2.5 Regular Preliminary Design (Air Force Projects) or Prefinal Design (Army Projects). This phase is seldom required. When it is the A-E's design shall be submitted at 60 percent stage of completion and permit a technical evaluation of design before final submission in order to verify concept and insure that the design is clear, consistent, within budget and suitable to proceed to final design.

2.2.6 Final Design Phase (Army and AF Projects). Final design phase documents shall be submitted in two parts. The first will be for review of the final design (100 percent complete except for incorporation of final review comments) and will include final drawings, typed specifications, design analysis, and construction cost estimate. The submittal will be reviewed by the District as described in paragraph 1.8. The A-E shall submit copies of corrected portions of the design, along with the originals of the review comments for backchecking. This process will continue until all review comments are satisfied or withdrawn. The A-E shall hold original documents until they are requested by the PM. Upon request from the PM, the A-E shall submit the corrected original mylar reproducible drawings and specifications ready for advertisement. If overlay drafting was used, composite chronoflex mylar reproducibles shall be provided. Ozalide mylars or reproducible sepias are not acceptable. The District drafting standards shall govern drawing quality.

2.3 Criteria.

2.3.1 The COR/PM will, in most cases, furnish the A-E with appropriate data and criteria concerning the project, such as site surveys, geotechnical reports, PDB's or PB's, etc. In addition, the following publications will routinely be furnished as applicable: Guide for A-E's, Volumes 1, 2, 3, and 4; Standard Details; Architectural and Engineering Instruction Design Criteria (Army projects only); Air Force Regulation, AFR 88-15 (AF projects only); Seismic Design for Buildings, TM 5-809-10; Safety and Health Requirements Manual, EM 385-1-1. The A-E will request technical manuals, AF manuals, guide specifications, and any other pertinent Government publications as required. As a guide in selecting these publications, refer to "Criteria Index" in volume 4.

2.3.2 Before negotiations, the A-E should thoroughly familiarize himself with the PDB's and PB's and the detailed technical criteria furnished since his design must conform with all applicable requirements contained therein. Any deviations therefrom, including the use of criteria obtained from the using agency or other sources, must receive prior approval of the COR/PM. Where the technical criteria contained or referred to herein is not met, the A-E will be required to conform his design to same at his own time and expense. Any questions or problems encountered by the A-E in following the criteria should be submitted to the COR/PM for resolution.

2.4 Geotechnical Investigations.

2.4.1 General Procedure. Results of foundation investigations, geological data, seismic design criteria, foundation design criteria, and pavement design sections are normally provided by the District in the form of geotechnical reports. Two geotechnical reports will generally be provided, consisting of: A preliminary report which presents general criteria and which will be provided after notice to proceed on A-E contract; and a final report which provides site specific data and recommendations as well as exploration logs and locations and which will be provided after exploration and testing are completed, based on the site layout contained in the 35 percent submittal. The A-E will provide a site plan mylar at the 3S percent submittal to the District on which the actual exploration locations and boring logs will be indicated by the District. The site plan shall show the topography and the coordinate grid. On larger jobs, a separate boring log sheet may be required. The A-E shall incorporate the information on reproducible drawings into the final plan set. On larger jobs, the A-E will insert the separate boring log sheet into the final plan set. The A-E shall accurately maintain boring log numbers, log profiles, and boring locations in the final design. The A-E shall utilize pertinent geotechnical details and design criteria in his design analysis, drawings, and specifications.

2.4.2 Investigations by A-E Firm. Generally, all geotechnical investigations will be conducted by the Corps of Engineers. However, when foundation investigations are performed by A-E contract, such information shall be obtained by a competent and reputable firm specializing in such work and satisfactory to District. Adequate information shall be obtained for use by designers of structures, grading, drainage, disposal fields, and other features. Prior to negotiation of contract, A-E will furnish recommendations as to extent and type of foundation investigation he proposes. Scope of these services agreed upon will become a part of the contract. A-E shall include cost of this investigation in his total fee proposal. A-E shall discuss results of field investigations with CO's specialists in foundation and materials design.

2.4.3 Airfield Pavements. For all projects involving design of airfield pavements, the District will furnish the following to A-E for incorporation into design analysis, plans, and specifications.

2.4.3.1 Sketches of pavement sections for the project, including types and thicknesses of surfacing and base materials, and lateral limits of each type.

2.4.3.2 Sketches of geometric layout of all joints, and sections of all joints showing configuration and sealing details.

2.4.3.3 Sketches of subdrains (if required for project) showing general location and typical sections, and guidance criteria as required.

2.4.3.4 Draft specifications (guide specifications marked up for the specific project) for inclusion by the A-E in the construction contract documents for the following items of work:

2.4.3.4.1 Clearing and grubbing.

2.4.3.4.2 Excavation, embankment, and subgrade preparation.

2.4.3.4.3 Subdrainage system (if required).

2.4.3.4.4 Base materials.

2.4.3.4.5 Surfacing.

2.4.3.4.6 Joint sealing.

2.4.3.4.7 Pavement repairs (if required).

2.5 Surveying and Mapping.

2.5.1 General. Surveying and mapping are normally performed by District and topographic maps and other survey data are provided to A-E. When surveying and mapping are performed by A-E, work will be accomplished by personnel licensed in such work.

2.5.2 Procedures. Generally type of work, extent, and accuracy requirements will be prescribed in a Government-furnished SOW for each specific project. When specific instructions are not furnished, the following will apply.

2.5.2.1 Basic mapping control, "P" lines for route surveys, as-built control, and cadastral surveys will be conducted to 3rd Order accuracy, both horizontally and vertically, and comply with "Classification, Standards of Accuracy and General Specifications of Geodetic Control Surveys," published by National Ocean Survey. Secondary or supplementary traverses, base lines, or levels may be executed to 4th Order grade A accuracy.

2.5.2.2 When surveys include legal land surveys or descriptions, work will be accomplished in accordance with Bureau of Land Management methods and procedures and state statutes, where appropriate, and by or under supervision of a professional land surveyor holding a current license issued by the state in which work is located.

2.5.2.3 All extension of survey control and mapping accomplished by photogrammetric methods and procedures shall comply with National Map Accuracy Standards.

2.5.2.4 The A-E will inform PM of his proposed methods, procedures, and type of equipment to be used, and work will be subject to inspection by Government personnel. However, the A-E will retain responsibility for quality of work within limits prescribed in the SOW.

2.5.2.5 Original field notes, computations, aerial negatives, photographs, and maps, without alteration, will be furnished the District when the project is completed.

2.5.3 Topographic Drawings. Topographic and planimetric data shall be plotted to prescribed scale and contour interval on polyester drafting film of approved quality in accordance with Seattle District Drafting Standards. When specific instructions are not furnished, the following will apply:

2.5.3.1 Contours shall be shown with fine, solid line. Every fifth (guide) contour shall be somewhat heavier and periodically broked for insertion of the contour elevation. In general, identification of guide contours shall follow a regular pattern to allow for "easy map reading."

2.5.3.2 All survey stations, bench marks, designations, and elevations are to be shown on topographic drawings in accordance with Seattle District Drafting Standards.

2.5.3.3 Buildings and structures shall be shown with solid lines, omitting cross hatching or complete blanking.

2.5.3.4 Maps and drawings will be so oriented that north will be toward top of sheet, when practicable, or toward left of sheet if top orientation is impractical.

2.5.3.5 Items to appear on all completed topographic drawings are as follows:

2.5.3.5.1 North arrow.

2.5.3.5.2 Grid ticks and values.

2.5.3.5.3 Scale and graphic scale.

2.5.3.5.4 Grid system, projection, and datum with latter referenced to National Geodetic Vertical Datum (NGVD).

2.5.3.5.5 Date aerial photography flown, if applicable.

2.5.3.5.6 Date of ground survey.

2.5.3.5.7 Survey control points, identification, and elevations where appropriate.

CHAPTER 3

PRESENTATION OF DATA

3.1 General. The standards for data presentation contained in this chapter shall be used in preparation of the contract drawings and the analysis of design. These standards generally describe various technical features and requirements of drawings and specific information that must be included on the drawings but is not intended to be a complete list of all features. The A-E shall show all the information necessary to completely describe the project. Drawing presentations shall be consistent with the District drafting standards. Use of District standard details shall be made whenever possible to decrease design costs.

3.2 Drawings.

3.2.1 1 General information Sheets (Plates G-1 and G-2). Depending on the size and nature of the project, one or two sheets shall be used to show the title and location of the project, schedule of drawings, a project location plan, and a vicinity map. See District drafting standards for the typical A-E title sheet.

3.2.1.1 The schedule of drawings shall include the consecutive sheet numbers, the drawing titles, and the discipline sheet numbers and plate numbers. Titles in the schedule of drawings shall agree exactly with those on the individual sheets.

3.2.1.2 The vicinity map shall be a single-line type showing major cities, nearby towns, major rivers, streams, routes of nearby highways and railroads, and a north arrow.

3.2.1.3 The location map shall show the north arrow and indicate the project area, contractor's equipment yard, contractor's entrance to the installation, haul roads, location of the District project office, location of the facilities engineer's or base civil engineer's office, hospital, fire station, and the location of the borrow and disposal areas. If there are no onpost borrow or disposal areas, provide a note to that effect.

3.2.1.4 Safety logo.

3.2.1.5 The type of submittal (concept/final) shall be indicated directly above the title box on plate G-1.

3.2.2 Mylar The mylars, complete with blank title blocks, will be supplied by the COR/PM.

3.2.3 Numbering of Drawings. All drawings will be consecutively numbered in box marked "sheet." The drawings are to be placed in the drawing set in the discipline sequence as shown in the District drafting standards. Discipline drawings shall be numbered in box marked "plate."

3.2.4 Signature. All final drawings prepared by the A-E shall bear the professional stamp/seal and signature of a licensed engineer or architect, preferably one of the principals. In addition, one of the principals shall sign the first sheet of each discipline. Name and certificate number of qualified analyst shall appear on sheet which shows design of a fallout shelter.

3.2.5 Graphic Scales. A graphic scale for each of the different scales used on a drawing shall be placed on the drawing to the left of the title block.

3.2.6 Orientation. Orientation of all plans and maps should be consistent, with north arrow pointed toward the top of the sheet or towards the left when necessary. Plans shall show both true north and reference north.

3.2.7 Title Block Layout. The A-E shall complete the entire title block of all final drawings as shown in the District drafting standards.

3.3 Drawing Preparation.

3.3.1 General. All drawings shall conform to the Seattle District Drafting Standards. Preparation of all work shall be for one-half size reduction. Therefore, it is necessary that drawings be inked or drawn with plastic lead using one as standard throughout the set of drawings unless instructed otherwise. Most modern reproduction processes of half-size or smaller do not tolerate shading, whether it be by color or background shading; therefore, shading will not be permitted on reproducible material. Parallel lines should never be so close together that they will merge into one line. The clear space between lines should always be of greater width than the adjoining lines. Lettering shall be single stroke, vertical, freehand or mechanical, all capitals, with a minimum height of 1/8 inch, again keeping in mind that lettering must tolerate half-size reduction. Drawings shall be edge bound for submittals.

3.3.2 Notes on Drawings.

a. Should not duplicate requirements stated in the specifications or requirements which should be in the specifications.

b. Should not make reference to pay items.

c. Should not refer to Owner, User, Architect, etc. Instead, use the words "Contracting Officer" or "Contracting Officer's Representative."

d. Should not refer to the specifications, such as note: "SEE SPECIFICATIONS."

e. Should not refer to bid items, that is bid item numbers should not be placed on drawings (unless absolutely necessary) without the written approval of the Seattle District Specifications Section.

3.3.3 Scales. Scales shall be selected to avoid overcrowded and cluttered conditions on the drawings. Drawing layout, together with the proper scales to properly delineate the project, should be carefully planned in advance. Where necessary to maintain proper scale, drawings of large structures shall be placed on two or more sheets, with appropriate key plan and match lines provided on these sheets. Deliberate reduction of the scale shown below or use of unusual scales is unacceptable. It is suggested that in designs for complex projects the floor plans be oriented the same direction on the drawings and drawn to the same scale to allow overlays to be readily accomplished. It is also suggested that the designer overlay sections to assure that major interferences between structural

members, architectural features (suspended ceilings, doorways) and HVAC ducts are resolved. Scales may be discussed with the PM at the prenegotiation conference. The scales indicated in the following list will, in general, be used for most projects:

3.3.3.1 Civil Drawings.

Site Plan - 1" = 40'
to avoid a crowded condition it may be necessary to use
1" = 20' or 1" = 10'.

3.3.3.2 Architectural Drawings.

Floor Plan - 1/4" = 1"0"
for large, open structures, a 1/8" = 1'0" scale may be used, with
congested areas such as toilet rooms, mechanical rooms, etc.,
being blown-up to 1/4" = 1'0" scale.

Building Sections - 1/8" - 1'0"

Reflected Ceiling Plan - Same scale as architectural floor plan.

Roof Plan - 1/16" = 1'0"

Elevations - 1/8" = 1'0"

Wall Sections - 3/4" = 1'0"

Details - as appropriate for clarity.

3.3.3.3 Structural Drawings.

Foundation Plan - same scale as architectural floor plan.

Floor Plan - same scale as foundation plan.

Roof Plan - same scale as foundation plan.

Wall Sections - as appropriate for clarity.

Details - as appropriate for clarity.

3.3.3.4 Mechanical-Plumbing Drawings.

Floor Plan - same scale as architectural floor plan, with congested areas enlarged as required for clarity.

details - as appropriate for clarity.

3.3.3.5 Electrical Drawings.

Power Plan - Same scale as architectural floor plan.

Lighting Plan - same scale as architectural floor plan.

Site Plan - 1" - 40'

Details - as appropriate for clarity.

3.3.3.6 All Discipline Drawings. When applicable phasing sequence construction schedule and limits of work shall be clearly indicated.

3.3.4 Revisions. Revisions are changes occurring at any time after the project is out for construction bids. The A-E will be responsible to make all necessary revisions to the drawings and specifications when he has been deemed liable due to an obvious error in the contract documents. Revisions to the drawings shall be made in accordance with the Seattle District Drafting Standards. Where revisions result in new sheets to be added, then the schedule of drawings shall be changed. The new sheet will be added at the end of the discipline to which it belongs, taking the next consecutive discipline number, with the sequential numbering handled thusly, 58, 58A, 59, etc. The revision block(s) shall indicate the changes resulting from the drawing(s) amendment. The revision symbol for such change(s) shall be first available letter such as A, B, etc. Drawings that are revised by Amendment or Proposed Project Modification (PPM) shall have the amendment or PPM number for same placed between the border lines directly below the title box. Brackets or clouds shall be placed around those area(s) of the drawing(s) being revised or amended. Only the latest amendment change(s) shall be enclosed with brackets or clouds.

3.3.5 Legends. Legends of symbols shall be placed on the initial sheet of each design discipline. If two or more disciplines are presenting the same item, they must use the same symbol.

3.3.6 Abbreviations. Define abbreviations on the first sheet of each discipline. Use abbreviations which are generally understood and accepted.

3.3.7 Structural Notes. Design loads and respective criteria shall be listed. See exhibit B for standardized notes to be placed on structural drawings. Primary factors used in calculating loads shall be listed such as follows:

3.3.7.1 Seismic. TM 5-809-10, zone, coefficients I and K.

3.3.7.2 Wind. ANSI A58.1, coefficients I and K, wind velocity and exposure factor, velocity pressure.

3.3.7.3 Snow. ANSI A58.1, ground snow load, thermal factor C_t, I, exposure factor L_c, and basic snow load.

3.3.7.4 Live Loads. TM 5-809-1, list specific.

3.3.7.5 List specific structural materials, specific type, and allow stresses for each.

3.3.7.6 List specific structural direction to be able to discern the principle methods of design.

3.4 Analysis of Design. The analysis of design is a document composed of a basis for design and computations. Chapters 4, 5, 6, and 7 delineate specific requirements of submittals by discipline.

3.4.1 Basis for Design. The basis of design documents the process used to achieve the project design solution through directives, statements of work, criteria, and studies which demonstrate different methods and systems analysis with justification for the particular selections made at each submittal stage. A title page which states the appropriate submittal, such as "Concept Data" or "Early Preliminary Data," and includes the name of the project, the location, name of the A-E firm, the Corps of Engineers identification, and the date, shall be provided. Also, provide a table of contents. Provide a statement referencing the geotechnical report, which shall be attached as appendix I. Number and letter paragraphs for review referencing and number pages. This document must be revised and updated for each submittal to reflect the level of development consistent with the percent of project completion. The entire document must be submitted for each submittal. The basis for design shall be bound. Submission of revised and updated pages only is not acceptable. Any additional background material necessary to describe the design solution, such as meeting minutes, letters, standard designs, or field investigations, should also be documented in the basis of design. The basis for design should be developed concurrently with the design documents and specifications.

3.4.2 Computation. The computations shall consist of a bound assembly of all functional and engineering criteria, design information, and calculations to support the design plans and specifications.

3.4.2.1 Design Calculations. The design calculations shall be presented in a clear and legible form incorporating a title page and a table of contents. Pages shall be numbered consecutively and identified in the table of contents. Cross referencing shall be clear. The sources of information, formula, and references shall be explained.

3.4.2.2 Preparation of Computations. The computations shall be presented on 8-1/2-inch by 11-inch paper, except that larger sheets may be used when required for graphs or other special calculations forms. The material may be typewritten, handlettered, handwritten, or a combination thereof, provided it is legible, clearly expressed, and properly indexed. Both side margins shall be 3/4-inch minimum to permit side binding and head to head printing. Calculation sheets shall carry the names or initials of the designer and the
checker and dates of calculations and checking. No portion of a design analysis shall be computed and checked by the same person.

3.4.2.3 Assembling and Binding of Computations. The several parts and sheets of a design analysis shall be given a sequential binding number and bound under a cover indicating the name of the facility and project number, if applicable. the title page shall carry the designation of the submittal being made. The complete design analysis presented with the final plans and specifications shall carry the designation "Final Analysis of Design" on the title page.

3.4.2.4 Classified Material. Analysis of design containing classified material shall be marked and handled in accordance with instructions of the COR/PM. Where only a minor portion of the criteria or calculation is of a classified nature, every effort shall be made to prepare the analysis of design so as to permit it to be an unclassified document with proper references to sources of classified material.

3.4.2.5 Concept and Early Preliminary Submittals. The analysis of design submitted with concept or EPD shall consist of the original or appropriate copies as required in the contract.

3.4.2.6 Final Submittal. A-E should append (i.e., catalog cuts) his final submission of the analysis with commercial and technical data of individual items not specifically identified but used in detail and specifications. This information should be limited to that which will be useful in final design review and administration of the construction contracts. The final submittal shall be consistent with the requirements of the contract.

3.4.2.7 Computer Analysis. This item is addressed specifically in chapter 1, paragraph 1.16.

3.5 Construction Analysis Report. The A-E shall submit a construction analysis report 30 days prior to the final submittal package. The purpose of this report is to bring to the attention of the contracting officer any special or unusual aspects of the design or construction which might affect the administration of the project.

This A-E report is for the orientation of Seattle District Resident Engineer and Construction Division personnel who will administer the construction contract. The report shall include a general description of the project, flag critical, unique, or special construction features or details and include, but not be limited to, the following:

3.5.1 Outline the project scope of work. Include construction schedule.

3.5.2 Explain the structural concept, materials, or unusual construction features. Outline critical structural elements, tolerance, special anchors, pile foundations, testing requirements, joint seals, etc.

3.5.3 Outline specified testing requirements, i.e., pile loading, field tests, etc. Where tests specified are unusual or nonstandard, give more detail.

3.5.4 Brief description of mechanical, electrical, utility designs, and unusual features such as high pressures, temperatures, capacities, etc.

3.5.5 Discuss critical areas where 100 percent inspection is required.

3.5.6 Discuss requirements for supervision of installation by the manufacturer.

3.5.7 Explain special requirements for operation ant maintenance manuals.

3.5.8 Outline the long-lead procurement items and Government-furnished equipment and the impact that these items may have on the timely completion or coordination of the project.

3.5.9 Explain customer operational requirements (i.e., utility outage periods, aircraft runway closures, phasing of work in certain buildings, areas, etc.). Refer to the specified requirement.

3.5.10 Discuss permit requirements.

3.5.11 Outline hazardous materials and safety precautions (i.e., asbestos, beryllium, lead paint removal, mercury, and toxic substances).

3.6 Typical Design Submittal. Requirements are shown in tabular form in exhibit B. The A-E shall use this listing as an aid to verify the completeness of his submittal package.